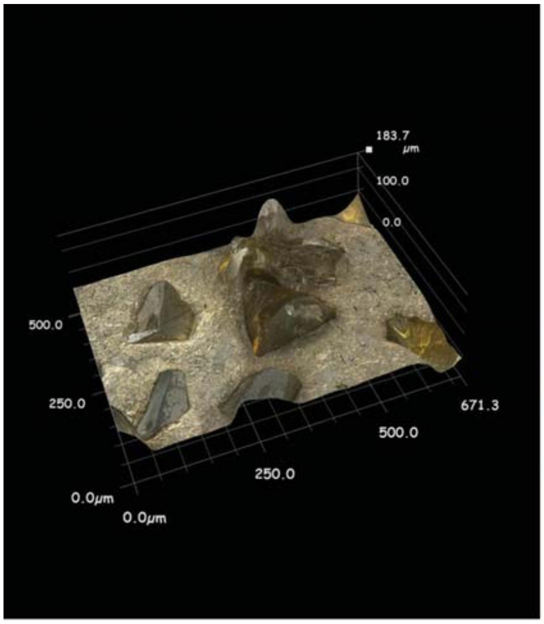
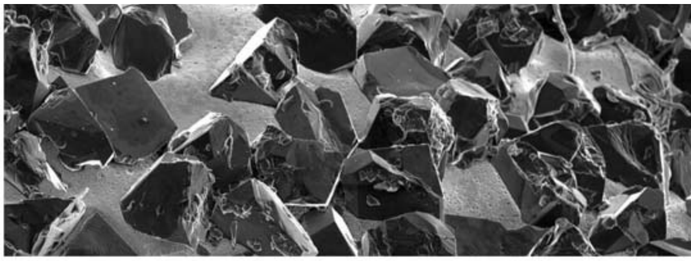
Spring 2014 $9.00 USD

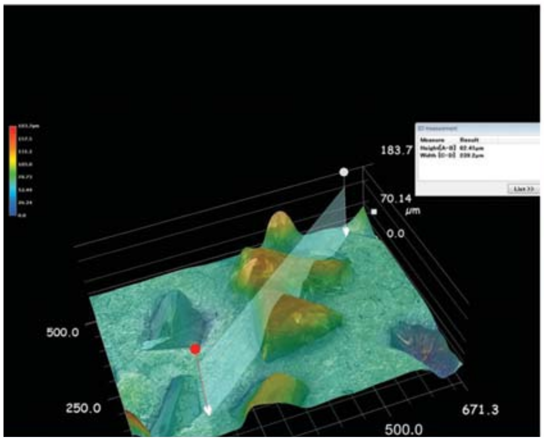
Finer Points

SUPERABRASIVE INDUSTRY REVIEW

Featuring Testing Facilities and Equipment







THIS ISSUE

A Finer Point of View

IDA 2014 Annual Meeting

News & Notes

An Advanced Deformation and Strain Analysis Method

Events Calendar

IDA Member Companies

The Virtual Grinding Laboratory

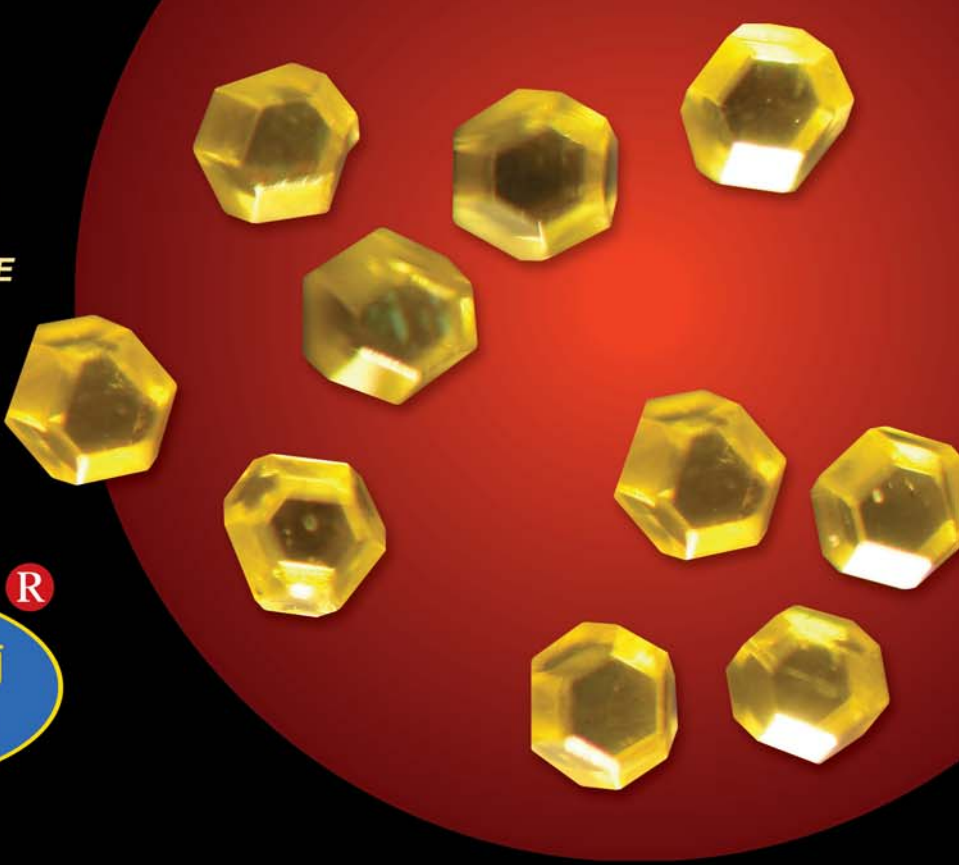
The Global Innovation Center – An Investment in Innovation is an Investment in the Customer

Application Development Center – Sandvik Hyperion

THE LONGEST RUNNING MAGAZINE DEDICATED SOLELY TO THE TECHNOLOGY AND APPLICATION OF SUPERABRASIVES

ZHONGNAN DIAMOND CO., LTD

… A GLOBAL MANUFACTURING FORCE



The largest manufacturer of synthetic diamond in China and one of the largest manufacturers of industrial diamond in the world.

The Company Features:

TREMENDOUS CAPACITY

- Production facility with 2.4 Million Square meters (26 million square feet) of factory space
- Annual output of high-grade synthetic diamond and Cubic Boron Nitride (CBN) can be up to 2 billion carats
- More than 2500 highly skilled employees

STATE OF THE ART RESEARCH & DEVELOPMENT CENTER

- Providing High Quality, Innovation and New Technology

AN INTERNATIONAL SALES NETWORK

- Guarantees outstanding customer service and support at competitive prices

ADVANCED TESTING EQUIPMENT TO CONTROL QUALITY AND CONSISTENCY

- Superior crystal shape, diaphaneity, compact strength and thermal stability

COMMITMENT TO THE ENVIRONMENT

- Recycling up to 95% of production materials
- Waste water recycled 100%

AWARD WINNING OPERATIONS

- ISO 9001:2000
- China Top Brand
- High-Tech Enterprise Certification
- China Brand Award For International Market Innovation
- Certificate Of Conformity Of Quality System

Contact Us Today And Join The Growing International List Of Satisfied Zhongnan Diamond Customers…

US OFFICE

American Zhong Nan Inc.
17890 Castleton Street. Suite# 108
City of Industry, CA 91748 USA
Telephone: 626-839-2886
Fax: 626-839-0887
Email: chimayinc@hotmail.com
Website: www.diamond-zn.com

CHINA HEADQUARTERS

Zhongnan Diamond Co., Ltd.
P.O. Box 101
Fangcheng, Henan China 473264
Telephone: +86-377-67319259, 67319599
Fax: +86-377-67319212, 67318220
Website: www.diamond-zn.com

Finer Points

departments

4 A Finer Point of View

6 Editorial

7 News & Notes

12 Calendar of Events

13 Ad Insertion

22 Membership Application

26 Checklist of things to do ...

COVER PHOTO

Photo Courtesy of Worldwide Superabrasives showing key elements of their newly opened Virtual Grinding Laboratory.

feature articles

5 IDA 2014 Annual Meeting

8 An Advanced Deformation and Strain Analysis Method

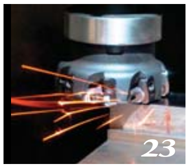
14 IDA Member Companies

17 The Virtual Grinding Laboratory

20 The Global Innovation Center – An Investment in Innovation is an Investment in the Customer

23 Application Development Center – Sandvik Hyperion

FINER POINTS is the longest running publication devoted exclusively to the understanding, selection and application of diamond, cubic boron nitride and related materials. It is edited for recipients who are involved in some way with these "superabrasives", either as providers of the materials, producers of products containing the materials or users of these products (e.g., grinding wheels, dressing tools, drill bits, saw blades, sawing wires, cutting tools, polishing compounds, CVD film products, etc.).



advertisers

ABC Warren Superabrasives Saint-Gobain Surface Conditioning Group	17
Apogee Precision Parts	IBC
Bogimac NV-SA	6
DCM-TECH, Inc.	26
Element Six	OBC
ILJIN USA, Inc.	15
Ulbrich Stainless Steels and Special Metals, Inc.	19
Worldwide Superabrasives, LLC	16
Zhongnan Diamond Co., Ltd.	IFC

A Finer Point of View…

A Finer Point of View…
Education versus Training

Over this past year I have been honored to lead this Association and as I look back over my time on the Board I can see we have shared a few successful INTERTECH conferences and kickstarted some important programs and projects for our Association that helped the organization grow as a value-added part of each member's business. I am proud to say we meet our member's needs every day in every way…

One project that has been a vital part of my administration is the ***Superabrasive Materials, Principles & Applications*** education course under the direction of our Education Chairman, Dave Edwards. After doing some adjustments and a screening at INTERTECH we will formally launch this valuable education program as a stand-alone event this coming November.

Education is the key to manufacturing success. Many operators and supervisors at manufacturing sites seem to be seriously lacking the proper education on the new materials being used and the new superabrasives (diamond, cubic boron nitride, polycrystalline and CVD Diamond) being applied. Sure, there have been a plethora of training courses initiated and some of these are quite good. Our industry still lacks a dedicated "superabrasives" education program. The key word here is ***education***.

Superabrasives are unique and the way they are applied is critical to their success in any application. Throw in the exotic materials (metal matrix composites, high silicon aluminum, superalloys, hardened steel, bi-metals, cermets, composites, etc.) being ground and/or machined and the entire process becomes a manufacturing engineer's nightmare of interacting conditions and parameters!

PRESIDENT
Mike Mustin

Experts agree that there is a clear conceptual difference between education and training. Training is the passing of information on to a trainee so that individual can do a particular job or operation whether they understand all the nuances of what they are doing or not. Education on the other hand is educating an individual so they can take that knowledge and apply it to any number of different applications or operations and know what they are doing and why! The IDA has always been a driving force in the development of education and training for this industry. Member companies created the first known literature and application guidelines back in the early 20th century when diamond was being applied in carbide grinding. In the 21st century we plan on reinventing those guidelines to meet today's applications of superabrasives on the wide range of materials being used in all industries.

The IDA is made up of the true experts in every aspect of grinding and machining. It only makes sense industry should look to us once again to lead the way in educating operators, engineers, supervisors and everyone else involved with grinding or machining operations in the industrial world. Let's make sure the new breed involved in manufacturing operations is not just ***trained*** but ***educated*** to a new level of expertise!

Make plans to attend the ***Superabrasive Materials, Principles & Applications*** education course coming in November! Get a true education and not just another training session.

Sincerely,

Mike Mustin
Industrial Diamond Association of America

Industrial Diamond
Association of
America, Inc.

PRESIDENT
Mike Mustin
American Superabrasives Corp.

VICE PRESIDENT
Troy Heuermann
3M Abrasive Systems Division

SECRETARY/TREASURER
Keith Reckling
National Research Company

PAST PRESIDENT
Edward E. Galen
Cinetic Landis Corp – CITCO/
Gardner Abrasives

BOARD OF DIRECTORS *(term)*
Joseph M. Connolly (12-14)
Element Six

Stephen Griffin (11-13)
Engis Corporation

David Spelbrink (11-13)
Lieber & Solow, Company

Ed Francis (13-15)
Crystallume Engineered Diamond
Products

Scott Ries (13-15)
Vollmer of America Corporation

Ben Williams (12-14)
FACT USA

David Simpson (13-15)
Worldwide Superabrasives

EXECUTIVE DIRECTOR
Mr. Terry M. Kane
Industrial Diamond Association
of America, Inc.
P.O. Box 29460
Columbus, Ohio 43229
Phone: 614-797-2265
FAX: 614-797-2264

E-Mail: tkane-ida@insight.rr.com

Website: www.superabrasives.org

FINER POINTS is the official publication of the Industrial Diamond Association of America, Inc. and is published fours times a year. Contributions are welcomed but the Editor reserves the right to accept or reject any material deemed inappropriate for publication. All by-lined articles published in this magazine represent solely the individual opinions of the writers and not necessarily those of the Industrial Diamond Association. Executive and Editorial Offices: Finer Points, P.O. Box 29460, Columbus, Ohio 43229, (614) 797-2265. Editor and Advertising, Terry Kane. Advertising rates and deadlines available upon request. Copyright 2002. Material in FINER POINTS may not be reproduced in any form without express written consent.

ISSN: 1090-0896

INDUSTRIAL DIAMOND ASSOCIATION OF AMERICA

2014 Annual Meeting

May 12, 13 & 14

MARRIOTT DOWNTOWN INDIANAPOLIS, INDIANA

IDA MEMBERS! The 68th Industrial Diamond Association Annual Meeting will be held at the Indianapolis Marriott Downtown in Indianapolis, Indiana. This location was selected so all our members can have the opportunity to preview the future site of INTERTECH 2015. This is also a venue where we can all get together and do some serious work on improving the IDA and the services we provide our members through new and innovative programs. This year your Board of Directors is organizing a meeting to address both new directions and programs for your IDA as well as current issues in our industry and for all industries in general. You can look forward to a few excellent guest speakers including William A. Strauss, Senior Economist and Economic Advisor Federal Reserve Bank of Chicago, Danny J. White, CSM, Manager Purdue Motorsports Purdue University who will discuss materials being developed for Aerospace and Auto racing and Pramod Gupta a principal with A.T. Kearney New York., Author of Industry Today Article "To Reshore or Not to Reshore: That is the Question". Attendees can share some outstanding IDA Committee reviews on everything from Finer Points to the launch of the new IDA website. Your IDA is implementing plans to interact with other Associations and Organizations with similar interests.

Mark the dates on your calendars now and make plans to attend this meeting. Nowhere else can you meet and discuss the issues we all have in common with your new Board of Directors, peers, customers and competitors! Here is your chance to let your voice be heard. This will be your "working" meeting … It is paramount that every company in the IDA participates in this year's meeting. Together we can be a force for change! If you are unable to make it we still hope you contact us with any suggestions or ideas you may wish presented at this meeting that can improve the IDA and its service to you, our valued member.

Cutoff date for hotel reservations at the IDA Discount rate is April 28. You must book by this date to receive the group rate of $159.00 (USD) per night.

PLEASE VIEW UPDATED ANNUAL MEETING INFORMATION POSTED AT: www.superabrasives.org

MARRIOTT

Indianapolis Marriott Downtown

350 West Maryland Street • Indianapolis, Indiana 46225 USA
www.marriott.com/hotels/travel/indcc-indianapolis-marriott-downtown

Call Terry or Kathy Kane with any questions at 614-797-2265
Emails can be sent to tkane-ida@insight.rr.com or kathykgc@insight.rr.com

BUYERS BEWARE … or at least be *careful!*

TERRY KANE, Editor

The INTERNET has reduced the size of our planet and companies wanting your business are just a click away… The down side is a new wave of devious solicitors is cramming your email (and your customer's) account with the promise of quality abrasives and tools at a reduced price…

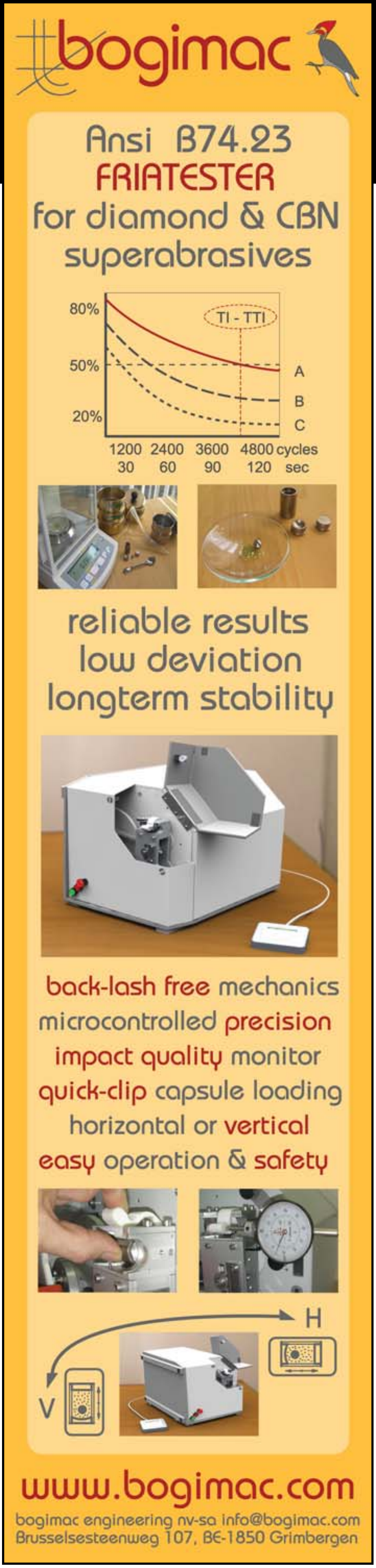
It wasn't so long ago U.S. regulatory agencies and companies instituted numerous recalls for defective, dangerous or toxic products, such as toothpaste, children's jewelry, toys, tools, dog food, baby bibs, tires and computer batteries. The common link between many of these products: They were made in a country noted for poor regulations and lack of concern for public safety. Many of these items are still floating around on INTERNET sites being resold as discounted items you can purchase at much less than what you find in your local store. These websites even misrepresent reputable companies and peddle products that are knockoffs of legitimate products and materials. Sometimes the unwitting buyer searching for a bargain will be directed to a website that even displays the appropriate logo and name brand. The unsuspecting buyer will then go ahead in good faith and buy the item …

Just this morning there was an investigative segment on the news showing how expensive makeup products were being sold on "discount" websites. Everything sent to the buyer was all well and good, the packaging looked the same, all the logos were there and the makeup worked very well … Then we heard the shocking news ... The products purchased over the INTERNET at the discount site turned out to be knockoffs. Slight flaws in the print and minor color variations in packaging showed that the INTERNET discounted product was not the real makeup the buyer thought they were purchasing. The packaging was not the worst problem. As it turns out the makeup had dangerous levels of contaminants and lead that, according to the doctors interviewed, could cause serious damage to the skin, both short term and permanently! They even tracked the knockoffs to the aforementioned foreign country renowned for sending dangerous products into the USA.

I cite these examples because our customers are targets of the same type INTERNET product scams and sales tactics. Granted, diamond, cubic boron nitride, polycrystalline materials and tooling may not be the same as toys or makeup but they are subjects of the same discount buying practices. The results of a buyer seeking discounted prices may not be ingested poison or permanently scarring makeup, but for our industry the end result could be sub-standard performance and costly production delays that could damage and scar business relationships …

In this and every issue of Finer Points we list companies that belong to the Industrial Diamond Association of America (IDA) and there is also a tagline that states "Always buy from an IDA Member"… There is a reason we say this. IDA Members adhere to a strict code of ethics and this is a customer's guarantee that to the best of their ability the products and services from an IDA Member have a certain level of quality and are backed by each company's good name.

Buying from INTERNET websites and "discount" companies can be hazardous to your health … They can also be hazardous to your business … ***BUYERS BEWARE!***



bogimac

Ansi B74.23
FRIATESTER
for diamond & CBN
superabrasives

reliable results
low deviation
longterm stability

back-lash free mechanics
microcontrolled precision
impact quality monitor
quick-clip capsule loading
horizontal or vertical
easy operation & safety

www.bogimac.com
bogimac engineering nv-sa info@bogimac.com
Brusselsesteenweg 107, BE-1850 Grimbergen

NEWS and notes

THE OWNERS AND TEAM MEMBERS OF WORLDWIDE SUPERABRASIVES, LLC (WWSA) ARE PLEASED TO ANNOUNCE THAT WWSA HAS BEEN PROUDLY SERVING THE SUPERABRASIVES INDUSTRY FOR 10 YEARS.

April 2014 – Boynton Beach, Florida USA

In celebrating our 10th anniversary of providing world-class superabrasive products, technical support and customer service, the WWSA team would like to thank our customers for providing WWSA with the opportunity to partner with them to produce the best possible superabrasive products for industry. WWSA's relentless pursuit of providing the best products, services and support to the superabrasives industry continues with our new Virtual Grinding Laboratory (VGL) and our new Materials Characterization Laboratory (MCL). Everyone at WWSA looks forward to serving the superabrasives industry for many years into the future.

DIAMOND INNOVATIONS HAS JOINED FORCES WITH SANDVIK HARD MATERIALS BY COMBINING THE PREVIOUSLY INDEPENDENT OPERATED COMPANIES INTO A NEW BUSINESS, SANDVIK HYPERION.

The merger of these businesses will benefit our customers by having a broader portfolio of materials solutions and by our increased scale in R&D and application development. Sandvik Hyperion is a full-line provider of cemented tungsten carbide, tungsten carbide powders, diamond and cubic boron nitride materials used in wide range of material-removal and wear-protection applications. In addition to innovative materials, Sandvik Hyperion offers product solutions, unique services and application development capabilities to support our customers' competitive needs. With advanced production capabilities in powder processing, sintering, high-pressure high-temperature synthesis, coating and finishing located in the Americas, Europe and Asia, Sandvik Hyperion has a truly global and fully integrated manufacturing. Johan Israelsson, President of Sandvik Hyperion says: "We aim to be the most reliable and technologically leading hard and super-hard materials company." For further information visit: www.hyperion.sandvik.com

ROLLOMATIC INTRODUCES NEW 6-AXIS "LONG-FLUTE" TOOL GRINDING MACHINE FOR DRILLS.

Rollomatic, a leading manufacturer of grinding and laser-cutting machines based in Le Landeron, Switzerland, announces the addition of a new tool grinding machine model GrindSmart® 528XF particularly suited for long drills as well as other rotary cutting tools. This machine has two distinctive new features: A patented and proprietary drill steady rest that can compensate for back taper as well as a combination of back taper and cylindrical drill relief. Plus, a patented and proprietary shank guidance system designed for quick setup. Among other options is a camera to locate coolant holes down to dia. 0.05 mm. The machine runs on Rollomatic's well-proven software platform VirtualGrindPro®. For more information visit www.RollomaticUSA.com or e-mail solutions@RollomaticUSA.com.

U.S. CUTTING TOOL CONSUMPTION UP 14.5% IN JANUARY.

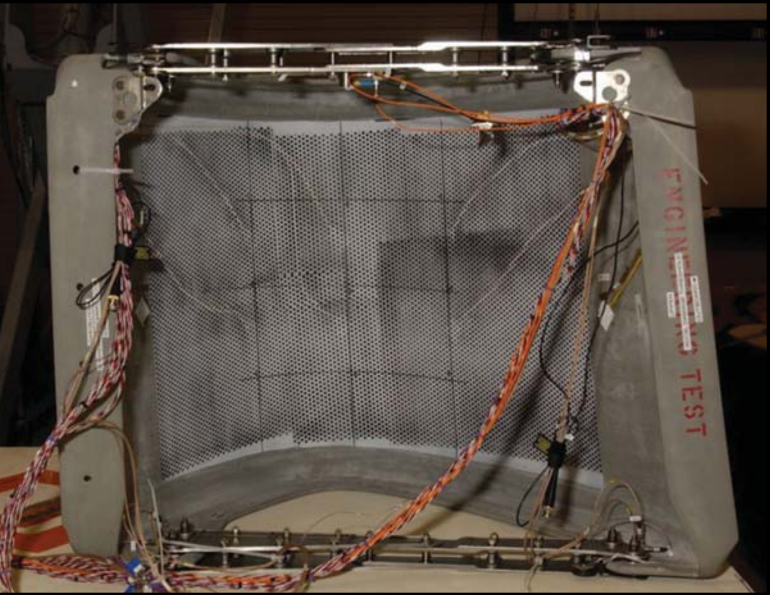
January U.S. cutting tool consumption totaled $158 million, according to the U.S. Cutting Tool Institute and AMT – The Association For Manufacturing Technology. This total, as reported by companies participating in the Cutting Tool Market Report (CTMR) collaboration, was up 14.5 percent from December's total and down 10.6 percent from January 2013. These numbers and all data in this report are based on the totals actually reported by the companies participating in the CTMR program. The totals here represent about 80 percent of the U.S. market for cutting tools.

RADIAC ABRASIVES, A TYROLIT COMPANY IS PROUD TO ANNOUNCE A NEW AND IMPROVED WEBSITE.

March 10, 2014 – Oswego, IL USA

Please visit www.radiac.com to tour the site today. The company has made several changes to the site to allow easier navigation for our customers. The new site is organized both by industry and application. With just a few clicks, the user can see which product best suits their desired application. The new search function allows for easy accessibility to all products whether Conventional or Superabrasive. Radiac is a leading manufacturer of Conventional Bonded and Superabrasives in North America. For more than 100 years, Radiac has delivered technology and quality in both product and service to the industry. As a leading full line producer of grinding wheels, Radiac offers more than 50,000 precision built products of high quality, performance, and repeatability for virtually every conceivable manufacturing application.

SPACE SHUTTLE IMAGE COURTESY OF NASA

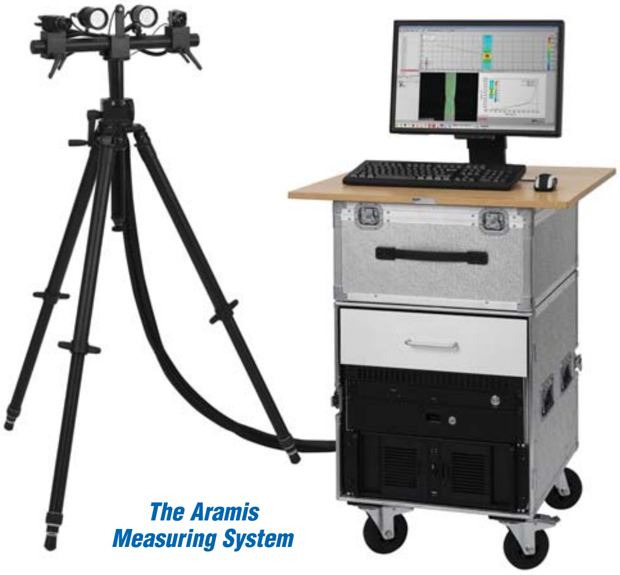


SPACE SHUTTLE WING SECTION

An Advanced Deformation and Strain Analysis Method

By: TIM SCHMIDT, Vice President
Trilion Quality Systems

Full-field optical techniques are increasingly appreciated as deformation, stress and strain measuring tools. This article discusses Aramis, an advanced deformation and strain analysis method that is extremely robust and easy to use. The stereo camera pair sensor becomes a point and shoot instrument that measures the shape, 3D displacements and surface strains of the test specimen. The technique is called 3D image correlation photogrammetry, often just referred to as DIC. The results are as if 10,000 strain rosettes or extensometers or draw wires or other single point gauges had been applied. Color maps show the results mapped onto either the camera images or the 3D shape.



The Aramis Measuring System

The general benefits of these measurements are shown below:

BENEFITS OF FULL-FIELD MEASUREMENTS

- Visualize Strain Gradients and Hot Spots
- Verify and Iterate Finite Element Models
- Test Non-Homogeneous and Anisotropic Materials
- Reduce the Number of Required Prototypes ($$$)
- Quicker Time to Market
- Improved Product Quality at Lower Cost
- Make “Impossible” Measurements

A single-point gauge cannot show strain gradients, and could miss hot spots. This is particularly the case with non-homogeneous and anisotropic materials, such as composite materials. Final results of optical measurements are compatible with finite element analysis software, and facilitate verification and iteration of models. Reduction of the number of required prototypes, quicker time to market, and improved product quality at lower cost provide a compelling return on investment justification. Perhaps most importantly, measurements that would otherwise be impossible become feasible, opening new avenues of investigation.

Local strain concentrations caused by internal defects in composite coupon during tension test. The specimen being tested is prepared by applying a random dot pattern, usually with ordinary flat black and white spray paint. When needed, high temperature paint, very high melting temperature (1400 degrees C) particles, or robust coatings can be applied. Standard field of views of the stereo sensor range from 10 mm to 5 meters, but measurements have been made on 100 meter diameter and larger wind turbines. A single camera may be used with a microscope or scanning electron microscope for fields of view as small as 100 microns, to understand micromechanics of failure of composites or microstructure and fracture behavior of new alloys. Pictures may be taken months apart for long term condition monitoring, but, on the other hand, high speed cameras with frame rates from hundreds to millions of frames per second have been used for dynamic measurements such as small arms fire onto helmets and armor, bomb blast effect testing, etc.

MATERIAL PROPERTY DETERMINATION

Often tests are run on a test machine with very limited instrumentation. Material properties are therefore based on average data, such as from a typical clip gauge or the overall travel of the load frame grip. But the material typically has high local strains such as necking, and for structure test coupons there will be important local strains due to design details. The optical test system measures data at thousands of pints simultaneously, and the results can be compared to finite element models.

For measuring basic properties such as Young's modulus and Poisson ratio, accurate results are obtained by averaging over many points, and by knowing the true stress and true strain from the camera measurements, which include changes in area.

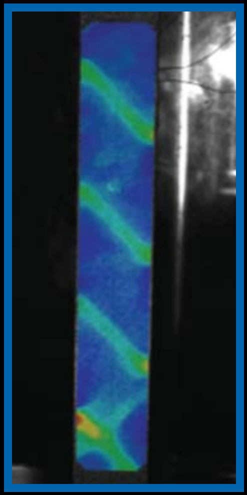
The Aramis full-field measurements overcome the limits of limited instrumentation, which may provide accurate but misleading data, since there is no knowledge whatsoever of what was really happening on most of the test specimen.

Strains during shear test of ceramic matrix composite specimen. Blue is highest strains and predicted failure location. Note that the weave of the specimen was also captured. Automatic measurements of material properties during a tension test.

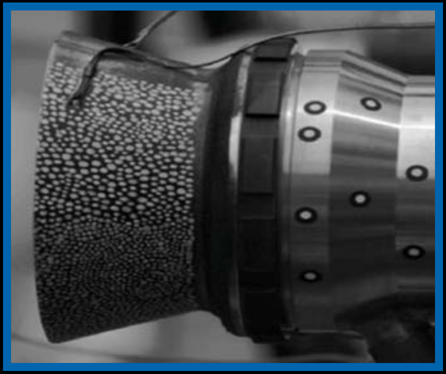
RESIDUAL STRESS MEASUREMENT

One of the more widely used methods for determining residual stresses is blind-hole drilling. When material containing residual stresses is removed by a small, shallow hole, the remaining material adjacent to it deforms in response to the localized stress relief. Strains associated with the stress relief are measured with special rosettes designed specifically for use with holedrilling. Residual stresses can then be computed from the strains. Although used successfully in numerous applications over the years, the strain rosette version of the method has

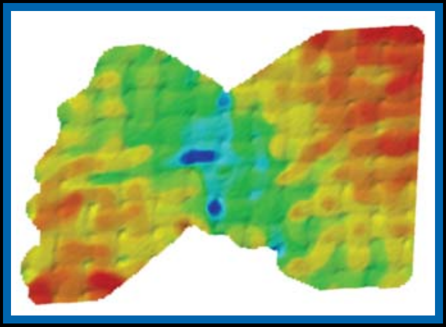
Local strain concentrations caused by internal defects in composite coupon during tension test.

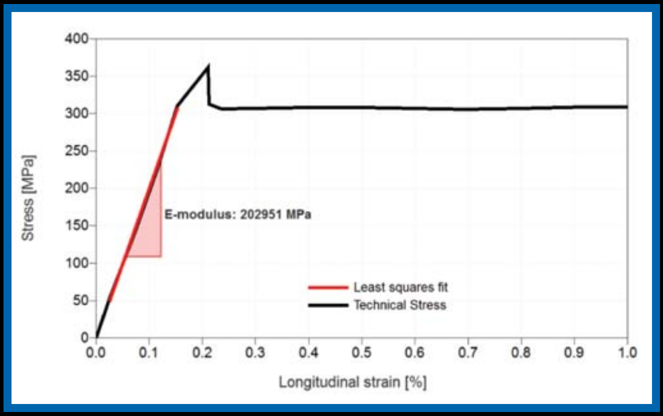


Rocket nozzle with high temperature resistant dot pattern applied.



Strains during shear test of ceramic matrix composite specimen. Blue is highest strains and predicted failure location. Note that the weave of the specimen was also captured.





Automatic measurements of material properties during a tension test.

Full-field optical techniques are increasingly appreciated as deformation, stress and strain measuring tools.

several drawbacks, such as the need to install a rosette and precision milling guide, which is time consuming and limits locations that can be investigated to those receptive to a rosette and milling guide. There can also be inaccuracies introduced by a hole drilled even slightly off-center in a rosette or by thermally-induced apparent strains (unless properly taken into account). Aramis measures displacements at many points around the hole and data can be read out easily and averaged to provide accurate stress levels for arbitrary hole locations. This is also being applied to measure stresses on bridge girders, to ensure that needed levels of pre-stress are still present.

LONG TERM CONDITION MONITORING

A jet engine turbine blade was patterned with robust coatings and then installed in an engine which was run for six months. The blade was then removed and the optical measurement compared the pre-run to post-run condition, showing all permanent displacements and strains which had built up. This is also being done for concrete civil structure condition monitoring Crack growth and widening is easily measured this way.

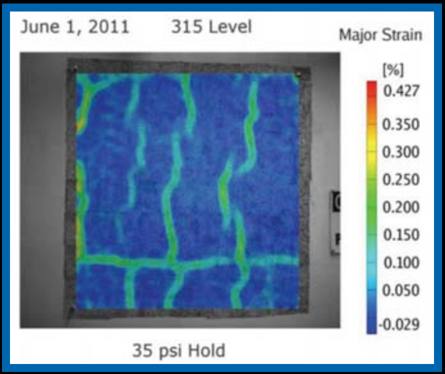
IMPACT TESTS

Measurements can be made with high speed cameras. A large amount of work is being done to investigate small arms fire onto new armor concepts that combine ceramics with woven Kevlar composite materials. In addition, Aramis became the required validation tool for finite element analysis of foam impacts into the space shuttle orbiter wing reinforced carbon carbon (RCC) panels, during the Return to Flight program after the loss of Columbia in 2002.

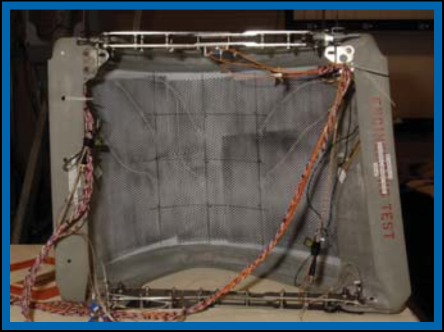
Most people are probably aware that the root cause of the Columbia tragedy was foam that broke loose from the external tank and impacted the reinforced carbon-carbon (RCC) leading edge on the left wing of the orbiter. Aramis was used for more than 100 RCC coupon ballistic impact tests at NASA Glenn and more than 25 full-scale leading edge shots at Southwest Research Institute. In addition, it was also used for more than 175 external tank coupon test impact studies as part of the broader impact investigation. LS-DYNA outputs displacements as a primary quantity, and so does a 3D image correlation system. Therefore, the top priority was to directly validate dynamic displacement data. However, it was also considered worthwhile to evaluate dynamic strain data.

A typical image correlation result from a ballistic impact on an Orbiter wing leading edge is shown. Each section line shows the out-of-plane displacement profile along the impact trajectory, with 38.5 microseconds between lines on the plot. Many other types of analysis and presentation were performed, including overlays of time histories at impact and maximum displacement locations, and study of principal, longitudinal and transverse strains. However, the main quantity of interest was maximum displacement evolution over time, as indicated in this figure. The space shuttle was not allowed to fly again until the finite element model results matched the Aramis measurements closely.

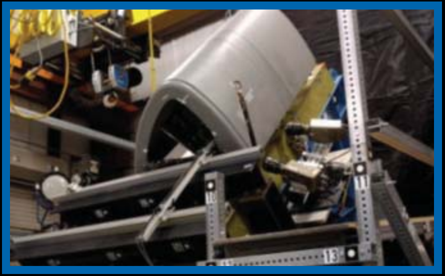
Aramis is often used for small arms fire tests onto Kevlar helmets. For these tests data is captured with high speed cameras at 50,000 frames per second. Besides displacement and strain data, velocity and accelerations are readily measured, such as very high peak acceleration at the impact location, and vibrations of ear flaps and other regions.



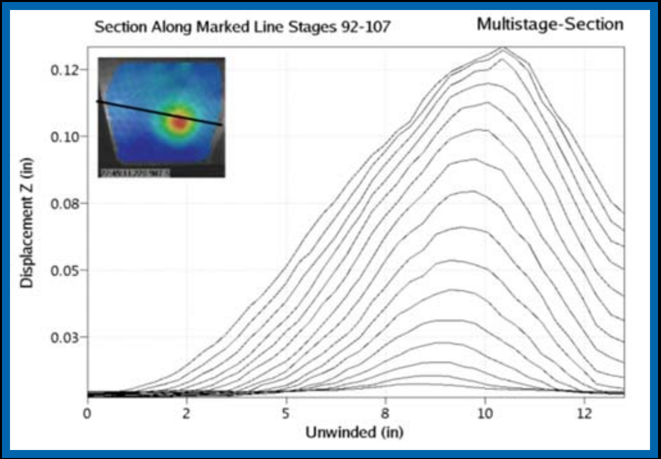
Full-field strain map showing hairline cracks during pressurization of nuclear reactor containment dome.



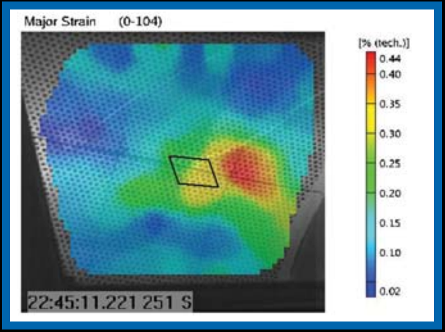
Space shuttle wing section prepared for full-field displacement and strain measurements with paint dot pattern. These test articles cost more than $1 million each.



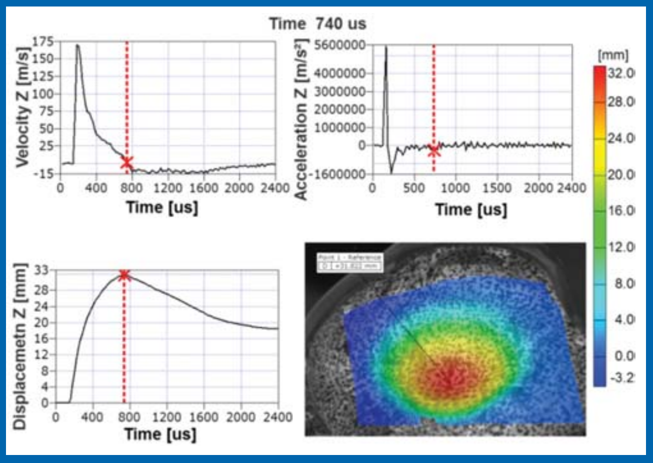
Space Shuttle Orbiter wing reinforced carbon carbon wing sections on test stand with high speed cameras for impact investigation.



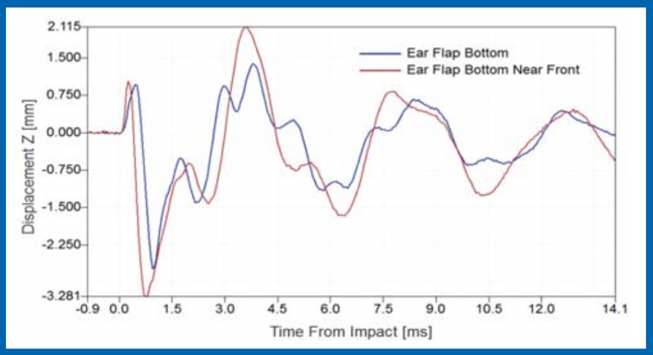
Profiles of displacement along the foam travel path. Time between lines is 38 microseconds.



The problem with strain gauges … The strain gauge had no idea there was a strain region twice as high a few inches away.



Displacement, velocity and acceleration measurements during Kevlar helmet small arms fire test.



Vibrations of ear flap of Kevlar helmet while stopping small arms fire.

SUMMARY AND CONCLUSIONS

The Aramis 3D digital image correlation system can easily measure shapes, 3D displacements, and surface strains, with very high accuracy and lateral resolution. Measurements can be made at size scales from 100 microns to 100 meters. Pictures can be taken months apart for long term condition monitoring, or at 1 million frames per second or more for dynamic measurements. This measurement tool should be considered whenever greater insight into material or structure behavior is desired. ■

About The Author

Tim Schmidt is one of the most experienced practitioners of 3D image correlation in the world. He started making full-field measurements when he was 15, doing large scale pulsed holographic portraits as well as interferometrymeasurements of vibrations. He received a BSE degree with a major in Mechanical Engineering from Cooper Union in 1989.

Tim was Principal Investigator on SBIR Phase I and Phase II contracts from 2005-2008 to develop high speed 3D image correlation for high rate Hopkinson Bar testing, in partnership with The Ohio State University. Tim was presented with a Silver Snoopy award by Astronaut Mike Foreman in November 2011 for his leadership of the Space Shuttle external tank photogrammetry team.

AMERICAS • EUROPE • CHINA • JAPAN • KOREA • MALAYSIA • PHILIPPINES • SINGAPORE • TAIWAN • THAILAND

SEE US AT IMTS 2014
McCormick Place, Chicago, IL
September 8-13
North Hall, Booth N-7148

Precision begins with the Powder

Superior selection + certified manufacturing
Single source + global reach

Precise and consistent sawing, drilling, grinding, lapping and polishing starts with the right diamond powder matched to the exact requirements for each application. The Saint-Gobain Surface Conditioning Group streamlines this process by providing a wide selection of options to cover challenges posed by almost every situation. Mesh product from ABC Superabrasives and Micron powder from Warren Superabrasives cover the particle spectrum from 16/20 mesh (~1000 microns) to 10 nanometers (10 x 10^{-9} meters). These powders are produced routinely and consistently in our state-of-the-art facilities. Best-in-class materials are provided to end users ranging from grinding wheel companies to magnetic recording head manufacturers.

Plus, our manufacturing facility in Olyphant, PA, USA is ISO 9001:2008 and ISO 14001:2004 certified, and our new plant in Handan, China is processing mesh diamond and CBN to help ensure optimal capacity and delivery the world over.

Call us today, or learn more online at www.abcwarren.com

ABC Warren Superabrasives
Saint-Gobain Surface Conditioning Group
1401 East Lackawanna Street
Mid-Valley Industrial Park
Olyphant, PA 18447 USA
Tel # 570 383 3261
Fax # 570 383 3218
www.abcwarren.com
Email: abcsuperabrasives@saint-gobain.com

ABC Superabrasives

WARREN Superabrasives

ECO FRIENDLY ABC Warren Superabrasives is an eco-friendly company

SAINT-GOBAIN

Calendar of EVENTS

To have your event or conference listed, please send information to: Finer Points Event Calendar • P.O. Box 29460, Columbus OH 43229 • Fax 614-797-2264 or email: tkane-ida@insight.rr.com

May 5-8, 2014
Offshore Technology Conference (OTC)
Reliant Park
Houston TX USA
www.otcnet.org

May 6-7, 2014
WAI Operations Summit & Wire Expo
Indiana Convention Center
Indianapolis, Indiana USA

May 6-8, 2014
mfg4
Connecticut Convention Center
Harford, Connecticut USA
www.mfg4event.com

May 6-8, 2014
MAZAK™ Northeast Technology Event
Northeast Technology Center
Windsor Locks, CT USA
www.mazakusa.com/technology-centers/northeast

May 6-8, 2014
FABTECH® Mexico
Centro Banamex
Mexico City, MX
www.fabtechmexico.com

May 12-14, 2014
MMTS – Montreal Manufacturing Technology Show
Place Bonaventure Montreal, Quebec Canada
www.mmts.ca

May 12-14, 2014
Industrial Diamond Association ANNUAL MEETING
www.superabrasives.org
Marriott Indianapolis Downtown
Indianapolis, Indiana USA

May 13-15, 2014
COMPOSITES MANUFACTURING
Northern Kentucky Convention Center
Covington, Kentucky USA
www.sme.org/composites

June 9-12, 2014
The Big M, including:
– RAPID Conference and Exposition
– SME Annual Meeting
– NAMRC-North American Manufacturing Research Conference
Cobo Center
Detroit, MI USA
www.thebigmevent.com

September 8-13, 2014
International Manufacturing Technology Show
McCormick Place
Chicago, IL USA
www.imts.com

September 17-19, 2014
SAE 2014 North American International Powertrain Conference
Chicago, IL USA

October 30 - November 4, 2014
Japan Machine Tool Fair
Tokyo Big Sight (Tokyo International Exhibition Center) Japan
www.jimtof.org

November 10-11, 2014
Concrete Sawing & Drilling Association Slab Sawing & Drilling 201
St. Petersburg College
Clearwater, Florida USA
www.csda.org

November 12-13, 2014
Concrete Sawing & Drilling Association Wall & Hand Sawing 201
St. Petersburg College
Clearwater, Florida USA
www.csda.org

November 11-13, 2014
FABTECH®
Georgia World Congress Center
Atlanta, Georgia USA
www.fabtechexpo.com

May 12-14, 2014
Industrial Diamond Association of America
Superabrasive Materials, Principles & Applications
Education Course
Huntsville, Alabama USA
www.superabrasives.org

Calendar Dates for 2015

May 18-19, 2015
Indianapolis Marriott Downtown

350 West Maryland Street
Indianapolis, Indiana USA
www.intertechconference.com

AD INSERTION ORDER

ADVERTISING IN FINER POINTS IS THE BEST WAY TO GET YOUR PRODUCTS SEEN

Finer Points

SUPERABRASIVE INDUSTRY REVIEW

P.O. Box 29460 • Columbus, Ohio 43229 • USA • Phone: (614) 797-2265 • Fax: (614) 797-2264 • E-Mail: TKane-IDA@insight.rr.com

The undersigned is purchasing a ________ page ad for his/her firm at $ ____________ per issue for __________ times beginning with the _______________, 20____ issue.

Commissionable at 15% for recognized Ad Agencies, if invoice paid within 30 days.

Date _______________ Signed by ____

ADVERTISER:

Company ________________________________ Contact ________________________________

Address ____

City __________________________ State/Province _______________ Country ______________________

Zip/Postal ___________________ Telephone __________________________ FAX ______________________

Email ____

AGENCY: ________________________________ Contact ________________________________

Address ____

City __________________________ State/Province _______________ Country ______________________

Zip/Postal ___________________ Telephone __________________________ FAX ______________________

Email ____

2014 ADVERTISING RATES

Please check size of advertisement desired. You will be invoiced

IDA MEMBER RECEIVES 20% AD DISCOUNT

Frequency	**1X**	**4X**
Full-page, 7-1/2"W x 10"H, 4 Color	$2375____	$2050____
Full-page, 7-1/2"W x 10"H, Black/2nd Color	$2050____	$1720____
Full-page, 7-1/2"W x 10"H, B & W	$1765____	$1600____
Half-page, 5"W x 7-1/2"H, Four Color	$1400____	$1225____
Half-page, 7-1/2"W x 5"H, Four Color	$1400____	$1225____
Half-page, Either Size, Black/2nd Color	$1225____	$1070____
Half-page, Black & White	$1070____	$ 985____
1/3 page, 2-3/8"W x 10"H, 4 Color	$1150____	$1070____
1/3 page, 2-3/8"W x 10"H, B & W	$ 985____	$ 900____
1/4 page, 4-3/4"W x 4-3/4"H, B & W	$ 900____	$ 820____
Back Cover, Full-page, 4 Color Only	4X Only	$3360____
Inside Front Cover, Full-page, 4 Color Only	4X Only	$3195____
Inside Back Cover, Full-page, 4 Color Only	4X Only	$3110____

Additional Charges (non-commisionable):

BLEED (full page - 8-3/4" x 11-1/4")	$125 additional charge____
PAGE SELECTION	$175 additional charge____

IDA MEMBER RECEIVES 20% AD DISCOUNT

Classified ad rates are Non-commissionable $85 – members $125 – non-members ________ All 2-1/4"W x 2-1/4"H

2014 EDITORIAL CALENDAR

Planned issues, topics and closing dates*:

Issue:	Editorial Feature*:	Closing
Winter 2013/2014	Materials and Processing	Dec. 1, 2013
Spring 2014	Testing Facilities and Equipment	March 1, 2014
Summer 2014	IMTS Preview and Machine Tools	June 1, 2014
Fall 2014	Diamond, cBN and Polycrystalline Materials	Sept. 1, 2014
Winter 2014/2015	INTERTECH 2015 – Call For Papers Registration Packet and Conference Details	Dec. 1, 2014

*Editorial topics & closings subject to change

SHIPPING INSTRUCTIONS

Fax, mail or email all printing materials to:

Production Manager
FINER POINTS MAGAZINE
P.O. Box 29460 • Columbus, Ohio 43229 USA
Phone: 614-797-2265 • Fax: 614-797-2264
E-Mail: tkane-ida@insight.rr.com

INDUSTRIAL DIAMOND ASSOCIATION OF AMERICA

MEMBER COMPANIES

Contact an IDA Member Company for superior products and services related to the superabrasives and ultra-hard materials industry. IDA Members follow a strict code of ethics to guarantee quality and dependability.

Always buy from an IDA Member!

3M Abrasive Systems Division
Website: www.mmm.com

ABC & Warren/Amplex Superabrasives
Website: www.saint-gobain.com

Abrasive Technology
Website: www.abrasive-tech.com

Abrasivos Austromex, S.A. DE C.V.
Website: www.austromex.com.mx

Action Superabrasive Products, Inc.
Website: www.actionsuper.com

Advanced Abrasives Corporation
Website: www.advancedabrasives.com

American Superabrasives Corp.
Website: www.diamonds-abrasive.com

Anco Industrial Diamond Corp.
Website: www.ancodiamond.com

Apogee Precision Parts
Website: www.natchain.com

Asahi Diamond America
Website: www.asahidiamond.com

Bogimac NV-SA
Website: www.bogimac.com

Bruce Diamond Corp.
Website: www.brucediamond.com

Cdp Diamond Products Inc.
Website: www.cdpdiamond.com

Chardon Tool & Supply Co., Inc.
Website: www.chardontool.com

Cinetic Landis Corp -
Citco/Gardner Abrasives
Website: www.citcodiamond.com

Continental Diamond Tool Corp.
Website: www.cdtusa.net

Crystallume Engineered
Diamond Products
Website: www.crystallume.com

Cutting Edge Services Corporation
Website: www.cuttingedgeservices.com

Darmann Abrasive Products
Website: www.darmann.com

DCM-TECH, Inc.
Website: www.dcm-tech.com

Delaware Diamond Knives Inc.
Website: www.ddk.com

Desmond-Stephen Mfg Co.
Website: www.desmond-stephan.com

Dev Industrial Corp.
Website: www.dev-group.com

Diamond Industrial Tools
Website: www.todit.com

Dianamic Abrasive Products Inc.
Website: www.dianamic.com

Eastwind Lapidary, Inc.
Website: www.eastwinddiamondabrasives.com

Element Six
Website: www.e6.com

Eloquence Corporation
Website: www.mwieloquence.com

Engis Corp.
Website: www.engis.com

FACT USA
Website: www.wmstrading.com
Website: www.factdiamond.com

Fort Wayne Wire Die Inc.
Website: www.fwwd.com

Greenlee Diamond Tool Co.
Website: www.greenleediamond.com

Iljin USA, Inc.
Website: www.iljindiamond.com

Industrial Diamond Laboratories Inc.
Website: www.industrialdiamondlabs.com

K & Y Diamond Ltd
Website: www.kydiamond.ca

Lach Diamond, Inc.
Website: www.lachdiamond.com

Lieber & Solow Co.
Lands Superabrasives Co.
Website: www.lieberandsolow.com

Lunzer Technologies, Inc.
Website: www.lunzer.com

Mapal Inc.
Website: www.us.mapal.com

Megadiamond Inc.
Website: www.megadiamond.com

Morgan Advanced Materials and Technology
Website: www.morganplc.com

NanoMech
Website: www.nanomech.biz

National Research Co.
Website: www.nationalresearchcompany.com

Niabraze Corp.
Website: www.niabraze.com

Noritake Co Inc.
Website: www.noritake.com

Pinnacle Abrasives
Website: www.pinnaclesf.com

Precision Eforming
Website: www.precisioneforming.com

Protech Diamond Tool Inc.
Website: www.protechdiamondtoolsinc.com

Radiac Abrasives Inc.,
A Tyrolit Company
Website: www.radiac.com

Sandvik Hyperion
Website: www.hyperion-sandvik.com

Saint-Gobain Surface Conditioning Group
(Saint-Gobain Ceramic Materials)
www.innovativeorganics.com

Scio Diamond Technology
Website: www.sciodiamond.com

sp3 Cutting Tools Inc.
Website: www.sp3cuttingtools.com

sp3 Diamond Technologies
Website: www.sp3diamondtech.com

Spec Tool
Website: www.spec-tool.com

Standard Die & Fabricating Inc.
Website: www.standarddie.com

H.C. Starck, Inc.
Website: www.hcstarck.com

HK Technologies
Website: www.hcstarck.com

Sumitomo Electric Carbide Inc.
Materials Group
Website: www.sumicarbide.com/diamondgroup

Superabrasives Inc.
Website: www.superabrasives.com

Syntech Abrasives Inc.
Website: www.syntechabrasives.com

Tomei Corp. of America
Website: www.tomeidiamond.com

US Synthetic Corporation
Website: www.ussynthetic.com

Ulbrich Stainless Steels &
Special Metals, Inc.
Website: www.ulbrich.com

Vollmer of America Corporation
Website: www.vollmer-us.com

Wemex Superabrasivos, S. DE R.L. DE C.V.
Website: www.wemex.com.mx

Worldwide Superabrasives, LLC
Website: www.worldwidesa.com

Zhongnan Diamond Co., Ltd
Website: www.diamond-zn.com

ILJIN For Your Superhard Material Solutions

ILJIN Diamond

IBN

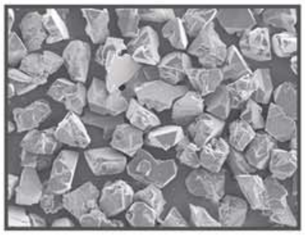
- Cubic Boron Nitride products suitable for grinding automotive and aerospace components

IBN 950

√ Low power consumption
√ Sharp cutting-edge
√ Fast regeneration of sharp cutting edge
√ Longer tool life

Excellent for
Cam · Crankshaft Grinding

IBN 300



√ Friable & Irregular shape
√ Low power consumption
√ High efficiency production
√ Sharp cutting-edge

Excellent for
Bearing Grinding

IBON

- PCBN (Polycrystalline Cubic Boron Nitride) composites available from low CBN content to high CBN content

PCBN

for
√ Cast Irons - Roughing: SB100 (Solid), Finishing: SB95N, SB95S2
√ Hardened Steels Continuous - SB500, SB600
√ Hardened Steels Interrupted - SB650, SB600, SB630, SB700
√ Powdered Metals - SB700, SB95S2, SB95N
√ Solid Form Available - SB100, SB500, SB600, SB630, SB650, SB700
√ RTG (Ready To Grind) Available: Brazed Semi-Finished

Tungsten Carbide products

- Available in various specifications

Tungsten Carbide Rod

for
√ PCB Micro Drill - N810X, M710
√ PCB Router and End Mill - HF6
√ End Mill, Drill, Reamer
  - EF8: Hardened steel, Cast iron, Al alloy
  - EF10, HF10, TH1008: General steel, Stainless steel, Ti alloy
  - EF12, HF12: Soft steel, Stainless steel, Cast iron
  - TH608: CFRP, Graphite (for CVD Diamond Coating)

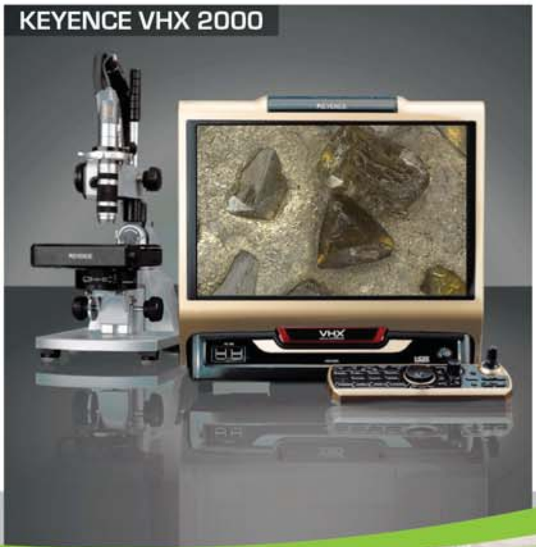
- **ILJIN USA Inc.** 652 N. Sam Houston Parkway E. Suite 140, Houston, TX77060, USA TEL: +1-281-448-5111 FAX: +1-281-448-5114

WWSA
WorldWide
Superabrasives LLC
ISO 9001:2008 CERTIFIED

WWSA unveils a new state-of-the-art superabrasives materials characterization laboratory

JEOL SEM

KEYENCE VHX 2000



Sonoscan D9600

WWSA continues our commitment to innovating new superabrasive products as well as providing industry leading technical support by adding a JEOL SEM with EDS, Keyence VHX 2000 Digital 3D Microscope and a Sonoscan D9600 to our materials characterization laboratory.

WWSA's VGL – Virtual Grinding Laboratory

Control your grinding experiments from anywhere in the world!

The Virtual Grinding Laboratory - VGL will allow any customer in the world to interactively control a grinding experiment conducted at our Boynton Beach, Florida manufacturing facility. WWSA's new ANCA RX-7 5-axis grinding unit with dual coolant systems will allow our customers to develop and optimize the best superabrasive products to present to their customers.

Worldwide Superabrasives, LLC • 2921 NW Commerce Park Drive, Boynton Beach, FL 33426
Tel: 954.828.9650 / Fax: 954.828.9651 • Toll Free: 888.410.1631 / Fax: 888.410.1630
Email: info@worldwidesa.com • Web: www.wwsa.com

VIRTUAL GRINDING LABORATORY

THE VIRTUAL GRINDING LABORATORY

Control grinding experiments from anywhere in the world!

By: Chris Winkel, President
Worldwide Superabrasives

Worldwide Superabrasives, LLC (WWSA) Boynton Beach, Florida has constructed the VGL to provide end users with a world-class versatile testing platform for superabrasive tools. Most industry today considers grinding as much art as science. WWSA hopes to bridge the gap between art and science by applying robust engineering principles to the testing of superabrasive products. Measuring the performance and physical characteristics of superabrasives will allow experts to not only understand the current state-of-technology, but also lead the way for real development.

The “virtual” aspect of the new VGL is the end-user’s ability to interactively attend any grinding experiment from any remote location around the globe via Citrix Go-To Meeting™ video conferencing platform. The end-user is able to see, instruct and interact in real-time with experienced grinding technicians throughout the testing process as well as view the live data produced by the ANCA RX-7 grinding unit. The following are a sample of the capabilities of the VGL Instrumented Grinding Test Bed:

Key Test Bed Characteristics

- Surface Grinding (Pendulum and Creep-Feed)
- Cylindrical Grinding (OD)
- Water Based Coolant Delivery & Filtration System with Chiller
- Oil Based Coolant Delivery and Filtration System with Chiller
- Engineered Coolant Delivery and Nozzle System
- Known Static and Dynamic Machine Characteristics
- In-Process Instrumentation
- Post-Process Instrumentation
- Advanced Graphical and Analytical Analysis of Grinding Data

Static and Dynamic Machine Characteristics

- Measured Relative Static Stiffness between Workpiece and Grinding Wheel
- Measured Relative FRF (Frequency Response Function) between Workpiece and Grinding Wheel

In-Process Measurements

- Normal Force
- Tangential Force
- Grinding Spindle Power
- AE (Acoustic Emission)
- Coolant Pressure (For Calculation of Coolant Jet Velocity)

Post-Process Measurements

- Workpiece Surface Finish
- Workpiece Surface Integrity
- Grinding Wheel Wear
- Grinding Wheel Surface Topography
- Abrasive Grain Wear

Grinding Data Analysis

- Λ_w - Work Removal Parameter
- Q_w' – Specific Material Removal Rate
- P’ - Specific Power
- e_c – Specific Grinding Energy
- G-ratio
- Λ_s – Wheel Removal Parameter
- Q_s' – Specific Wheel Removal Rate

In addition to the above features, WWSA has partnered with Dr. John Webster of Cool-Grind Technologies, LLC to optimize the ANCA RX-7’s dual chilled coolant delivery systems. Dr. Webster made the following comments in his recent report on the VGL – “The Virtual Grinding Laboratory consists of a fully instrumented grinding machine, post-grind surface measurement capability, and remote access of in-process and post-process signals and data. As compared to universities and government laboratories, testing at the VGL does not need to be publishable, is on-demand for a fee, data produced is confidential, and competitive industrial research is encouraged." Dr. Webster's tremendous experience and background will assist in developing the best possible superabrasive testing laboratory possible.

Complimenting the new VGL is the following world-class analytical and measurement equipment in the materials characterization laboratory:

JEOL SEM with EDS CAPABILITIES

JEOL SEM WITH EDS CAPABILITIES

An analytical, low vacuum Scanning Electron Microscope (SEM), the InTouchScope features integrated Energy Dispersive Spectroscopy (EDS) with the latest Silicon Drift Detector (SDD) technology. Ease of use is a key feature of all JEOL SEMs, and the versatile InTouchScope has functions that users and customers at all levels will appreciate:

- Automatic SEM condition setup based on sample type
- Simultaneous multiple live image and movie capture
- Easy sample navigation at 5x – 300,000x magnifications
- Quantitative and qualitative elemental analysis
- Low and high vacuum operation
- Wireless capability
- Portable, compact, small footprint SEM

The InTouchScope features all the capabilities of a full size tungsten SEM with integrated EDS analysis in a small, ergonomic and intuitive design. An onboard turbo pump make this a truly self-contained, portable SEM that is easy to set up anywhere in the lab.

Complimenting the new VGL is the following world-class analytical and measurement equipment in the materials characterization laboratory:

JEOL SEM with EDS CAPABILITIES

SONOSCAN D9600 ACOUSTIC EMISSION MICROSCOPE

KEYENCE VHX2000

SONOSCAN D9600 ACOUSTIC EMISSION MICROSCOPE

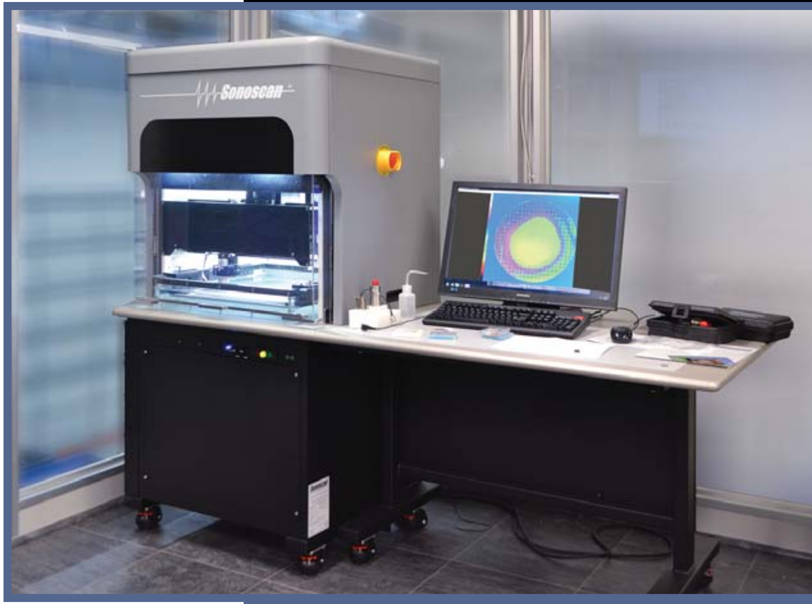
Representing the newest in C-SAM acoustic micro imaging systems, the D9600™ delivers the unrivaled accuracy and robustness that you expect from Sonoscan instruments, plus an improved electronics and software platform that raises the performance level for laboratory acoustic microscopes. Specifically designed to serve as a general purpose tool for failure analysis, process development, material characterization and low volume production inspection, the capabilities of the D9600 are truly unmatched.

Coming Soon: XRD – X-ray Diffraction

KEYENCE VHX 2000

The VHX Series Digital Microscope is an all-in-one microscope system that can observe, measure and record – all within a single system. Extremely versatile, this equipment combines the capabilities of a conventional stereomicroscope, compound microscope, and metallurgical microscope. Elevating digital microscopy to a new level, the VHX Series achieves a 0.1x – 5,000x magnification range. One of the main benefits of this digital microscope is its incredibly large depth-of-field, making it possible to inspect an object from any angle and perform 2D/3D observation and measurement.

The Keyence VHX 2000 will provide the ability to generate in-process color images of the tool's bond/crystal wear characteristics down to 1 micron which is a powerful analytical tool to identify the optimal bond/crystal combinations.



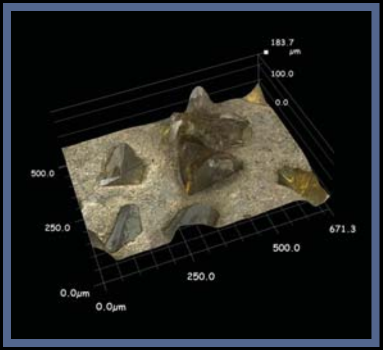
SONOSCAN D9600 ACOUSTIC EMISSION MICROSCOPE

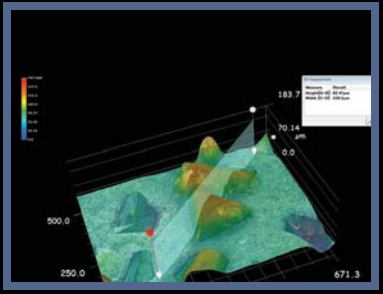
KEYENCE VHX 2000

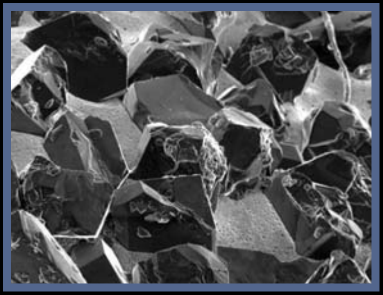
SUMMARY:

Scientists have developed a world-class grinding platform with precise and repeatable data measurement systems. This, as well as a world-class materials characterization laboratory will provide end-users with the ability to optimize their superabrasive products. It will also allow superabrasive tool manufacturers to select the best possible diamond or CBN crystal for a particular application and then validate the tool in the VGL and materials characterization laboratory. ■

For additional information, please contact WWSA at vgl@worldwidesa.com or visit the website at www.wwsa.com







YOUR SOURCE FOR DRAW QUALITY
TITANIUM, NIOBIUM AND ZIRCONIUM

ULBRICH STAINLESS STEELS
& SPECIAL METALS, INC.
EMAIL TiNbZr@ulbrich.com
203 239-4481

WWW.ULBRICH.COM

Ulbrich

GLOBAL PARTNER IN THE STAINLESS STEELS AND SPECIAL METALS MARKET SINCE 1924

CUSTOM PRECISION ROLLED STRIP, FOIL AND WIRE

TIGHTER THAN INDUSTRY STANDARD TOLERANCES

13 LOCATIONS WORLDWIDE

THE GLOBAL INNOVATION CENTER – AN INVESTMENT IN INNOVATION IS AN INVESTMENT IN THE CUSTOMER

By: Joe Connolly, Element Six Regional General Manager – Americas

Press Hall at the Global Innovation Center

The Global Innovation Center employs over 110 Scientists, Physicists, Chemists, Engineers and Technologists

In a market place characterized by global competition, innovation is a critical business practice for gaining competitive advantages. For companies innovative capabilities are even essential to their goal of becoming world market leaders. Radical and revolutionary innovations tend to emerge from R&D – and these innovations are driven by customer demand. Indeed, besides development of core R&D competences and financial support, the identification of customer needs is one key innovation process.

A HIDDEN CHAMPION

Even if not always visible at first glance, manufacturing processes of some of the world's biggest industry brands would be hardly possible without versatile synthetic diamond abrasive and technological advanced material solutions and products: They are used in applications such as cutting, grinding, drilling, shearing and polishing, while the extreme properties of synthetic diamond beyond hardness are already opening up new applications in a wide array of industries such as optics, water treatment, semiconductors and sensors. The company currently supplies around 20,000 products for about 3,000 customers and is continuously developing its product portfolio.

Element Six has recognized that in order for its customers to successfully compete in today's market place, driving innovation into customer related applications and technologies is a top priority for future success. The company is a member of the De Beers Group of Companies and produces synthetic diamonds for industrial purposes. With annual revenues of $500m, it is one of the global market leaders in this business. It designs, develops and produces synthetic diamond supermaterials, and operates worldwide with primary manufacturing facilities in U.S., China, Germany, Ireland, Sweden, South Africa and the U.K.

INTRODUCING INNOVATION

During 2010 Element Six recognized that to maintain a leadership position, and to enable its customers to achieve sustained competitive advantage, the solution lay in innovation. They set about consolidating 7 discrete innovation functions located around the world into one central unit where innovation could be undertaken efficiently and effectively thanks to the bringing together of over 110 scientists and engineers. By locating their experienced material scientists, physicists, engineers and technicians under 'one roof', and combining this existing talent and expertise with the latest thinking and ideas from material science by hiring young, best-in-class talent straight from some of the top research institutes and universities around the world, the company would be able to create a team and innovation unit that would be able to quickly help customers establish product differentiation through innovation.

This innovation unit is called the Global Innovation Center (GIC). In July 2013, it opened as one of the world's largest and most sophisticated synthetic diamond research and development facilities. The company invested nearly 50 million US-Dollars in a 5000m2 site with technology experts coming together in one state of the art synthetic diamond innovation center. The GIC brings together all the production processes found across the company's production sites, and combined these with precision machining and oil & gas application testing facilities normally found at their customer's R&D centres.

Facilities at the GIC include modeling and design, materials preparation, a High Pressure High Temperature synthesis press hall, Chemical Vapor Deposition reactor synthesis labs, post-synthesis processing such as polishing, cutting or shaping, materials analysis and characterization and end application testing. The result is a physical environment which fosters and enables open collaboration and partnership with customers in support of their product development programs. The center develops a pipeline of innovative synthetic diamond and related supermaterial products for customers, in industries from oil and gas drilling to precision machining and electronics. Across these markets and more, the new GIC allows the rapid development of customized material within abrasive and technology applications, which will enable extreme leaps in endapplication performance and productivity.

COLLABORATION IS KEY

At the same time, the center is no ivory tower where products are developed disregarding market needs. Customers and partners are invited to work on innovations with scientists on location at the GIC. This increases the speed with which new developments are driven to market introduction many times over – and powerfully combines manufacturer innovation with end-user innovation.

For the first time in the global synthetic diamond industry comes the ability to partner with customers to rapidly design, manufacture and test market-ready solutions all under 'one roof'.

The combination of simulating different production sites in one single center leads to synergies that are passed on to customers. The proximity also enables collaboration to develop and introduce new materials and products quickly. The GIC consolidates and strengthens innovation capability to be at the forefront of diamond technology.

This is also reflected in the choice of location which was identified as Harwell Science Park, just outside Oxford in the United Kingdom. The location boasts a world-renowned reputation, proximity to key international connections and access to the UK's strong science and engineering talent base. Element Six has also recognized the importance of partnering with academic institutions, and actively works with and supports academic research projects focused on synthetic diamond with universities including Oxford and Warwick University.

SUCCESS STORY IN THE MAKING

Equipped with world class R & D and application testing capabilities, the GIC offers for the first time under one roof a flexible, rapid end to end innovation capabilities in synthetic diamond and related materials. However, this fusion of disciplines and expertise did not just happen overnight.

The success and potential of the GIC comes directly from a 50 year, world-leading track record of applying the extreme properties of synthetic diamond within abrasive applications and a diverse range of advanced technologies. And the GIC, the world's largest R&D center for industrial diamonds, promises a bright future – the first results are assuring: GIC has established teams specializing in providing tailored abrasive solutions and developing value added products – for example: A newly established proof of performance testing program provides information to customers on optimum grinding parameters. This type of information was previously unavailable to customers - if they did not embark upon their own similar inhouse testing program. Element Six was also able to establish a dedicated Precision Grinding Innovation Hub at the GIC. The new capability comprises end to end on-site diamond and CBN synthesis, advanced product and tool characterization as well as extensive application testing capabilities.

Currently, there is an expansion of the current GIC production site by an additional 2.000m2. And by 2015 the goal is to enlarge R&D capabilities at the GIC by two additional presses, that will bring new insights and knowledge which can be translated into materials that deliver competitive advantage for customers.

There is certainly more to come, with the Global Innovation Centre journey having only just started. Element Six wants to succeed as an innovation driver within the industry and most importantly, as a partner to its customers – and the Global Innovation Center will be essential to achieving that goal. ■

Material Scientists Test Synthetic Diamond within Customer Tooling On Site – Rapidly Reducing R&D Development Times

The Reactor Room Produces Synthetic Diamond for Use in Optical, Semiconductors, Sensors and Water Treatment

The Fast Prototype Room Enables Test Cutters for Oil & Gas Drill Bits to be Shipped to Customers for In-Field Testing in Days not Weeks

Scientists Use High Pressure High Temperature (HPHT) Presses to Create the Equivalent of the Eiffel Tower Turned Upside Down on a Soda Can to Create Synthetic Diamond

Industrial Diamond Association of America, Inc.

MEMBERSHIP APPLICATION

Company ______________________ Address ______________________
City ______________________ State ________ Zip Code/Postal Code ______________ Country ______________
Shipping Address (Can not ship to PO Box) ______________________
City ______________________ State ________ Zip Code/Postal Code ______________ Country ______________
Phone ______________________ Fax ______________________
E-mail ______________________ Web Site ______________________
Official Representative ______________________
Others (Participating in IDA Activities) ______________________
Principle Business Activity ______________________
Which applies to your company: ________ Corporation ________ Partnership ________ Sole Proprietorship
Provide names of principle officers or partners: ______________________
When was your company established? ____________
How long has your company been engaged in superabrasive/ultra-hard material industry? ________

List at least two business references which are current IDA REGULAR MEMBERS. REQUIRED for Consideration
1. ______________________
2. ______________________

CHECK APPROPRIATE MEMBERSHIP

________ Regular Membership

Any company and/or individual classified as a superabrasive/ultra-hard material supplier, tool maker, machine tool builder or related business which HAS an office and a local, state or province business license in the United States, Canada or Mexico is eligible for membership in this category. Only one individual shall be designated by each member company as the IDA Delegate with voting and other privileges described in the By-Laws.

(DUES CATEGORY)

The dues category for Regular Members is determined by annual sales volume expressed in US $ as indicated below. Check to appropriate category:

_____	Category 1	$2,750 per year	Over $20,000,000 Annual Sales
_____	Category 2	$2,090 per year	$10,000,000 - $19,999,999 Annual Sales
_____	Category 3	$1,850 per year	$6,000,000 - $9,999,999 Annual Sales
_____	Category 4	$1,450 per year	Under $2,000,000 - $5,999,999 Annual Sales
_____	Category 5	$1,095 per year	Under $1,999,999 Annual Sales

________ International Membership

Any company and/or individual in the diamond and/or cBN business which DOES NOT have an office and a local, state or province business license in the United States, Canada or Mexico is eligible for membership in this category. An International member shall have all the privileges of regular membership, except that he/she cannot vote at any membership meetings, participate in statistical reporting for the North American market, hold proxies or serve in any office in IDA. Annual fee for International Member is **$3990 per year**.

________ Associate Membership

Available for companies having a principal office in the U.S.A., Canada or Mexico, which are ***providing products or services to companies within the superabrasive/ultra-hard material industry***, but are not engaged in selling, using or dealing in industrial diamonds, cubic boron nitride, compacted diamond/cbn, diamond film or products containing diamonds/cbn. An Associate member shall have all the privileges of regular membership, except that the Delegate cannot vote at any membership meetings, participate in statistical reporting for the North American market, hold proxies or serve in any office in IDA. Annual fee for an Associate is **$600 per year**.

________ End User/Contractor Membership

Available for any global companies or individuals, which USE products classified as superabrasives or ultra-hard materials, but are *NOT ENGAGED IN SELLING* industrial diamonds, cubic boron nitride, compacted diamond/cbn, diamond film or products containing diamonds/cbn. An End User/Contractor member shall have all the privileges of regular membership, except that the Delegate cannot vote at any membership meetings, participate in statistical reporting for the North American market, hold proxies or serve in any office in IDA. Annual fee for an End User/Contractor is **$400 per year**.

________ Academia/Research Membership

Any non-profit Academic institution or R & D organization is eligible for membership in this category. An Academia/ Research/ member shall have all the privileges of regular membership, except that the Delegate cannot vote at any membership meetings, participate in statistical reporting for the North American market, hold proxies or serve in any office in IDA. Annual fee for Academia/Research is **$175 per year**.

________ Student Membership

Any FULL TIME Student *NOT ENGAGED IN SELLING* industrial diamonds, cubic boron nitride, compacted diamond/cbn, diamond film or products containing diamonds/cbn is eligible for membership in this category. A Student shall have all the privileges of regular membership, except that he/she cannot vote at any membership meetings, participate in statistical reporting for the North American market, hold proxies or serve in any office in IDA.Annual fee for a Student Membership is **$100 per year**.

________ Senior Membership

Any individual who has worked for and/or retired from an IDA Member company or is no longer active in the diamond or CBN business is eligible for membership in this category. A senior member shall have all the privileges of regular membership, except that he/she cannot vote at any membership meetings, participate in statistical reporting, hold proxies or serve in any office in IDA. Annual fee for a Senior is **$75 per year**.

Name of Delegate Member: ______________________
Title: ______________________
E-Mail: ______________________

**** Applications for ALL Memberships are reviewed by the Board of Directors and must be approved by a two-thirds vote.***

________ Affiliate Membership

Each company that enrolls as an IDA Member is entitled to have a second person at that company designated an Affiliate Member. The first Affiliate member will receive IDA material at no further cost. Additional persons at Member companies can be added as Affiliate Members to receive IDA materials. Annual fee for additional Affiliates is $100 per person. Name of 1st Affiliate Member (no charge):

Name of 1st Affiliate Member (no charge): ______________________
Name of 2nd Affiliate Member ($100): ______________________
Name of 3rd Affiliate Member ($100): ______________________

If your company wants more Affiliate Members, please attach additional sheets.

WHAT IS THE IDA?

***The Industrial Diamond Association of America, Inc.* is a non-profit trade association and was incorporated on March 29, 1946 in the State of New York. It is the oldest and most prestigious association in the superabrasive/ultrahard materials industry. Activity and focus has evolved from natural diamond to superabrasives and most recently, to all ultrahard materials including CVD Diamond. Members include material suppliers, tool manufacturers, component producers, machine tool builders, end users, academia/research affiliates and other companies related to the research, manufacture, application, use and sales of superabrasives.**

WHAT DOES THE IDA DO?

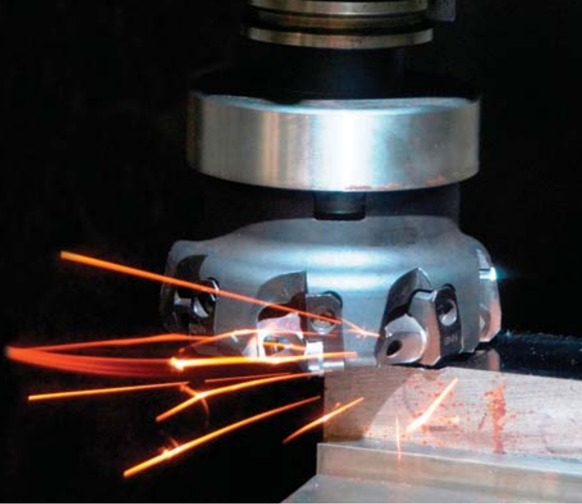
- **Oversees Statistics Reporting Program**
- **Establishes Industry Standards**
- **Interacts With Global Associations And Organizations**
- **Creates And Distributes Market Studies & Data**
- **Organizes And Presents Technical Seminars & Conferences**
- **Serves As A Government Liaison For Industry Guidelines And Regulations**
- **Participates As Member Of World Diamond Council**
- **Provides Safety / Regulatory Reports And Advisement**
- **Resource For General Information And Consultation**

OTHER MEMBER SERVICES

- PUBLISHES QUARTERLY MAGAZINE
- HOLDS ANNUAL CONVENTIONS
- HOSTS IDA WEBSITE WITH MEMBER FOCUS AND DIRECTION
- PROVIDES SPECIFIC ASSISTANCE ON INDIVIDUAL MEMBER ISSUES
- CREATES AND DISTRIBUTES PUBLICATIONS ON PRODUCTS AND APPLICATIONS
- ACTS AS A COLLECTIVE VOICE FOR INDUSTRY CONCERNS

FAX completed membership form to 614-797-2264

APPLICATION DEVELOPMENT CENTER – SANDVIK HYPERION



By: Cory Carpenter, Application Development Engineer and Anshul Singh, Technology, Metal Cutting - Sandvik Hyperion

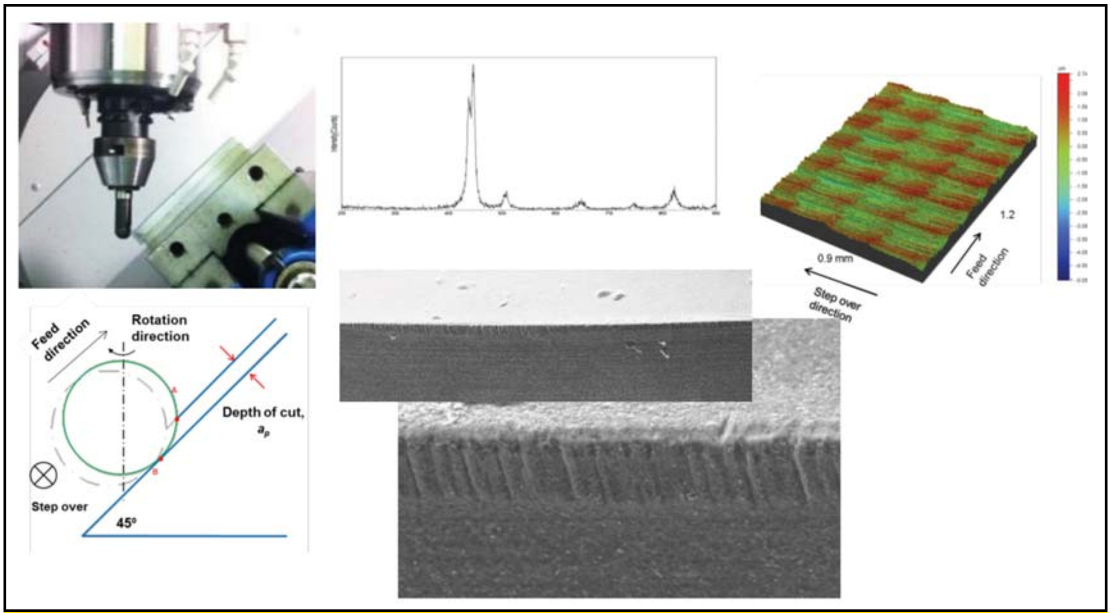


Figure 1: Case study where ball nosed end milling of hardened steel is simulated in the ADC; combination of milling equipment, test design and analytical techniques were utilized to provide in depth analysis of the machining application.

The application development center (ADC) at Sandvik Hyperion, Worthington, Ohio USA provides a broad range of state of the art capabilities that deliver quality solutions to challenges in machining applications. It allows Sandvik Hyperion the strategic advantage of providing guidance to customers on suitable grade, tool geometries and machining conditions while at the same time fueling future internal growth. For the customers, it's an avenue to utilize capabilities to conduct in-depth analysis of specific applications and identify optimal conditions without spending valuable time and resources to generate volumes of data. The synergy, thus generated, allows customers the possibility to significantly reduce the time it takes to commercialize new products. Creative solutions for a wide range of applications and analysis requests are made possible by the combination of available machines, analytical tools and highly skilled technical resources. The equipment capability spans turning, milling, drilling and grinding along with possibility to fabricate customized tools for desired application. This is coupled with analytical tools such as optical and electron microscopes, white light interferometer, surface profilometer and dynamometers that allow documentation of tool degradation and critical performance characteristics. In addition, experienced engineers and technicians combine the machining test data and analytical results to deliver personalized assessments for the customer.

Figure 2: Cylinder head for an automotive engine (milled surface).

Each application development project conducted in the ADC has unique requirements in terms of complexity and data requirement. The following two cases demonstrate how the available capabilities can be used to generate customized solutions for widely differing opportunities in PCD/PCBN machining applications.

Case 1: Milling of Al Alloys for Automotive Applications

Milling is a key operation in the automotive industry where millions of cylinder heads are machined annually all over the world. The primary work piece material used in these heads is low Si content Aluminum. PCD grades have been successfully employed in these applications as they allow consistent machining at very high speeds. Given the constant desire of the automotive industry for improved tool performance, there was a customer driven effort to conduct a focused case study to further

Table 1: Summary of Machining Conditions Evaluated in the Study

MACHINING CONDITIONS	
Speed (m/min)	600 - 2000
Feed Rate (mm/rev)	0.05 - 0.5
Depth of Cut (mm)	0.2 - 2.0

understand the dynamics underlying this application and improve performance of existing PCD grades. Portions of this study have been summarized in this case to demonstrate the intricacies of the application and utilization of existing capabilities. The project focused on evaluation of critical to quality parameters and develops a model system that allows relative grading of different solutions for the customer. The automotive industry ranks tool performance and surface finish quality as the most important attributes for PCD grades. Tool performance can be broken into such variables as cutting tool wear and burr formation. These hold significant value to the customer as minimizing tool change overs and reduced additional processing for burr removal helps reduce process cost. A simulated machining trial was designed to replicate milling of cylinder heads on a similar low silicon Aluminum alloy. The variables governing tool performance that were evaluated consisted of machining conditions, tool grade and geometry.

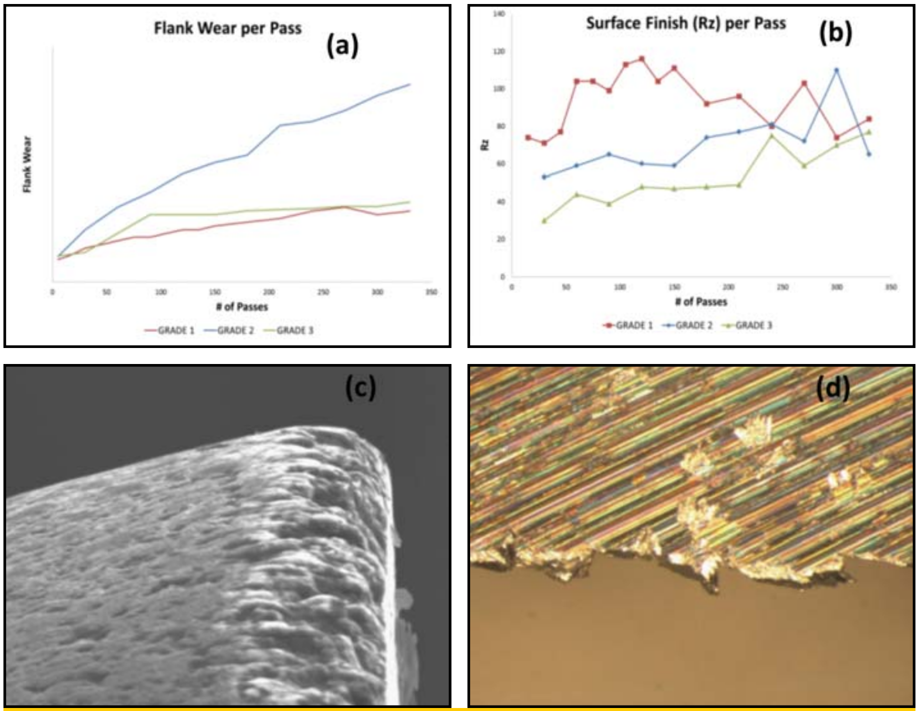


Figure 3: (a) Flank Wear Progression for Different PCD Grades, (b) Surface Finish (Rz) for Different Grades at Different Number of Passes, (c) Scanning Electron Microscope Image of a Cutting Edge, (d) Burr Formation on Al Workpiece.

Validation of simulated test set up was done by comparing the ADC test results against tool performance data at customer site. This enabled calibration of tool behavior in lab vs. actual application environment.

A correlation between tool performance, edge degradation, surface finish and burr formation was developed as a result of the detailed investigation. These relationships provided customer access to evaluation of tool behavior at a more fundamental level. This in turn permitted better selection of tool geometry and PCD grade.

Case 2: Machining of sintered powder metal alloys for valve seat applications

Sintered powder metals (PM) encompass a wide range of material compositions depending on the parts and application. These materials are processed by compacting and sintering of elemental powders to near net shapes, which require machining before they are used. One of the main applications for such alloys is in valve seats for automobile engines. As auto engines strive for fuel efficiency and performance, sintered powder metals aim for increased temperature resistance. This is achieved by increasing alloy content (Co, Cr, Mo etc.) thereby making it difficult to machine. This case describes a portion of study conducted to simulate valve seat application utilizing high and low content powder metal alloys in the ADC and develop solutions that can have wide use in the industry.

In valve seating applications, tools undergo plunge impact as well as continuous cutting. The PCBN grade was expected to demonstrate both superior toughness and wear to be successful. The critical to quality parameters for the customer were dimensional consistency and surface finish. For trials conducted in the ADC, a simulated machining set up was developed to replicate the application environment (Figure 4). The test evaluated machining conditions, tool geometry, and two material compositions covering a range of alloying additions.

Commercially available competitive inserts and Sandvik Hyperion grades (cBN content ranging from low to high) were used for evaluation during the study. A variety of edge evaluation tools were used to

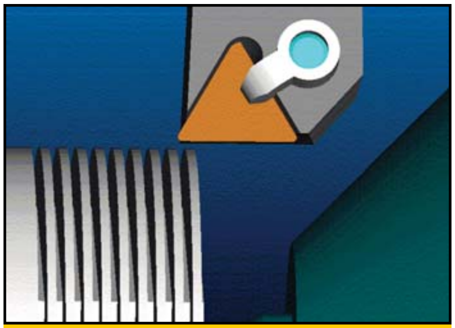


Figure 4: Machining test set up to simulate plunge cutting of valve seats

Table 2: Machining conditions used for simulated trials in the lab.

	Plunge Cutting	Continuous Cutting
Speed (m/min)	80-250	80-150
Feed Rate (mm/rev)	0.05-0.15	0.05-0.15
Depth of Cut (mm)	0.05	0.25

analyze cutting edge degradation. Flank wear depth measurements were recorded during the test and are reported in Figure 5. Based on test data, PM161 demonstrated capability to machine a wider range of alloy composition.

The two cases described give an overview of different type of projects that the Application Development Center in Worthington undertakes. These projects allow customers and project managers access to test data in a timely manner and permit appropriate grade and tool selection for specific applications. ■

The application development center (ADC) at Sandvik Hyperion, Worthington, Ohio USA provides a broad range of state of the art capabilities that deliver quality solutions to challenges in machining applications.

Table 3: Composition for Workpieces Used in Case Study, Alloy Contents Based on Typical Exhaust and Intake Valves.

	Hardness	Alloy Content
Exhaust Valve Seat	40HRc	Co: 16-22% Mo: 8-15%, Cr: 3-6%, W: 2-5% Cu: 10-17%, V: 1-3%, C: 0.5-2%
Intake Valve Seat	40HRc	Cu: 3-7%, Cr: <3%, C: 1-2.5%

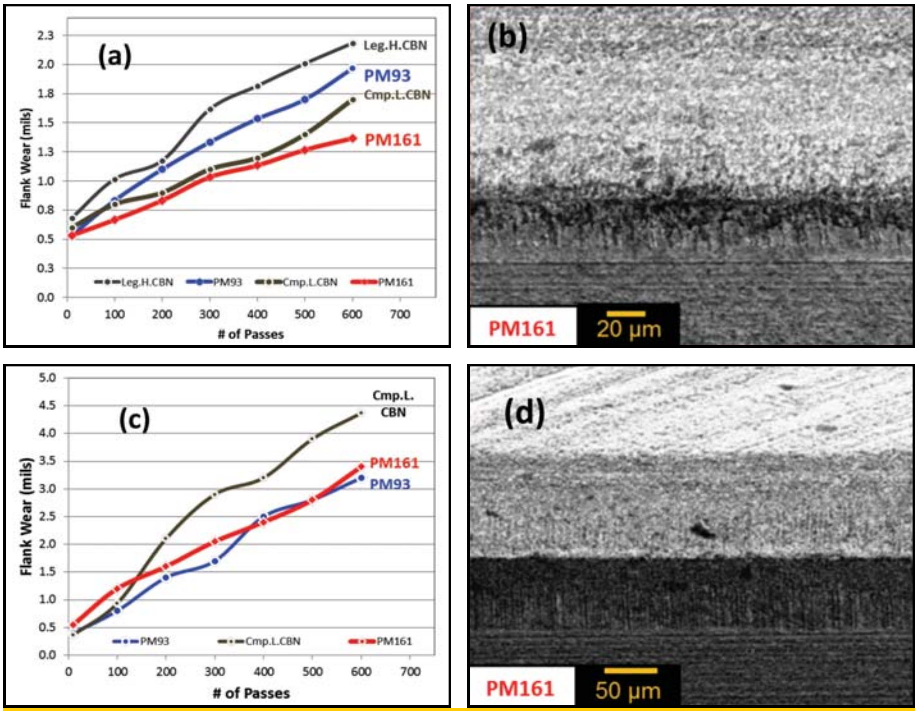
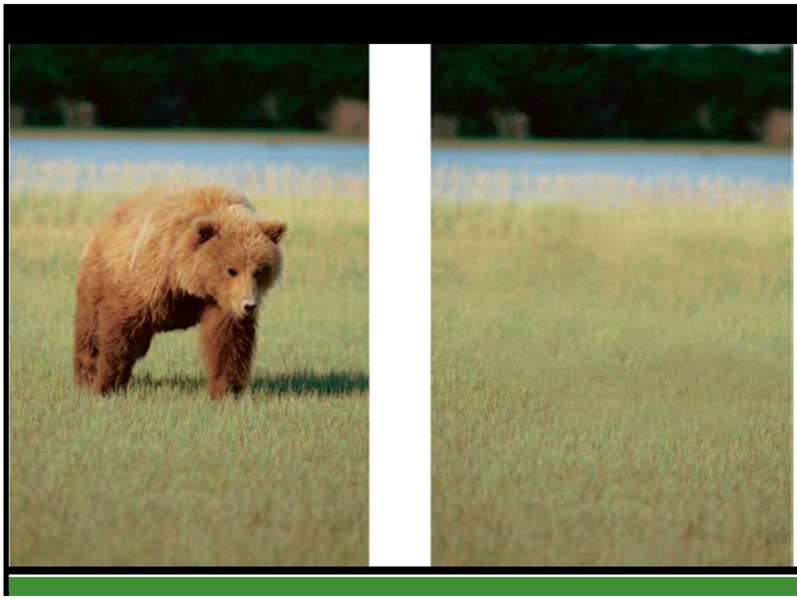


Figure 5: (a) Flank Wear Progression in Highly Alloyed Exhaust Valve Seat Material, (b) SEM Image for PM161 Tool at Test Stoppage, (c) Flank Wear Progression in Low Alloyed Intake Valve Seat Material, (d) SEM Image for PM161 Tool at Test Stoppage.



Here today...

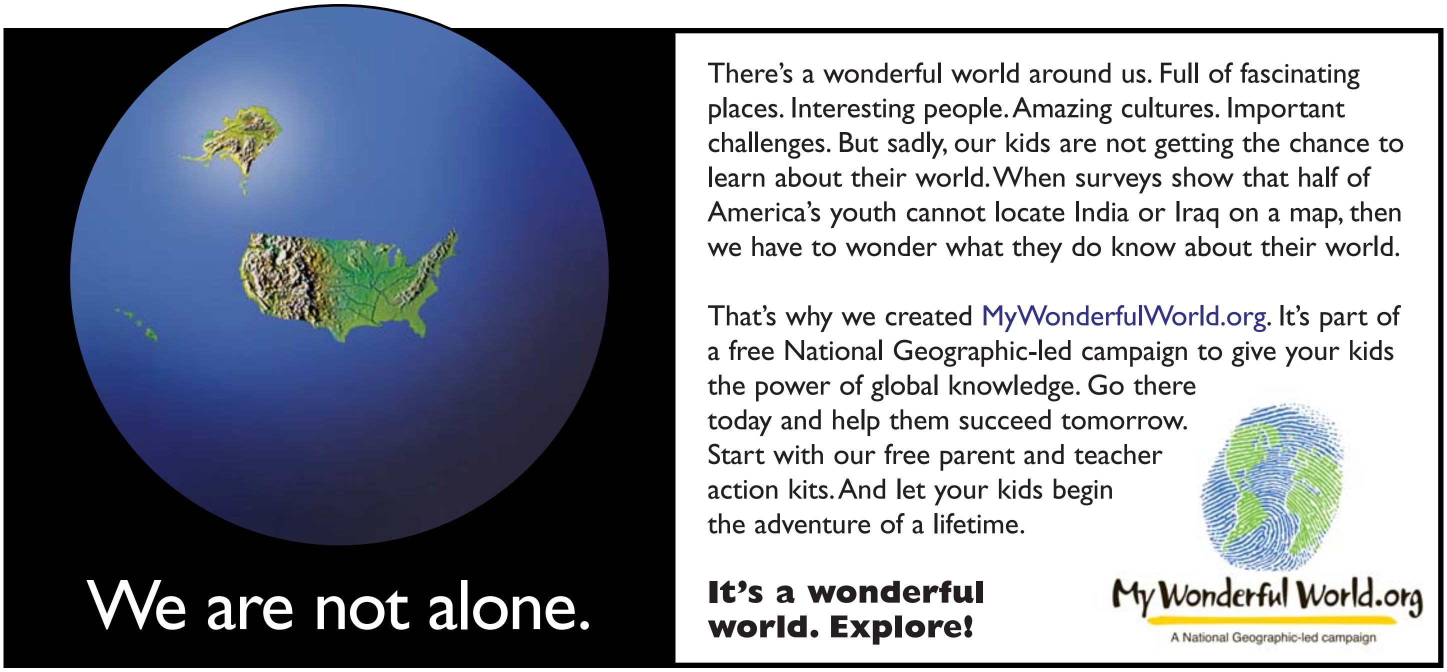
But what about tomorrow? While hundreds of millions of Americans are enjoying the wonders of our national parks each year, the future of the very things they're coming to see is at risk. For example, although the Mexican black bear population has been slowly recovering at Big Bend National Park, their ongoing survival is threatened.

Americans for National Parks is a coalition working to preserve these national treasures, and all the priceless experiences they provide. Find out how you can help at: **www.americansfornationalparks.org**.

1300 19th Street, N.W., Suite 300
Washington, D.C. 20036
1-800-NAT-PARK (628-7275)

A public service message.

AMERICANS FOR NATIONAL PARKS
Because there's just too much to lose.



We are not alone.

There's a wonderful world around us. Full of fascinating places. Interesting people. Amazing cultures. Important challenges. But sadly, our kids are not getting the chance to learn about their world. When surveys show that half of America's youth cannot locate India or Iraq on a map, then we have to wonder what they do know about their world.

That's why we created MyWonderfulWorld.org. It's part of a free National Geographic-led campaign to give your kids the power of global knowledge. Go there today and help them succeed tomorrow. Start with our free parent and teacher action kits. And let your kids begin the adventure of a lifetime.

It's a wonderful world. Explore!

My Wonderful World.org
A National Geographic-led campaign

CHECKLIST
of things to do...

■ ■ ■

Finer Points
SUPERABRASIVE INDUSTRY REVIEW

☐ Renew my subscription to Finer Points magazine.

☐ Reserve my ad space in the next Finer Points issue.

☐ Submit article for consideration in future issue of Finer Points.

☐ Send Finer Points my business news, new products, new hires, promotions, industry news and other press release items.

☐ Send in my membership application to the IDA.

☐ Refer a company to IDA for consideration as a member.

☐ Visit the IDA Website at: www.superabrasives.org and submit a question or comment.

☐ Contact an IDA member for products or services.

Designer and Manufacturer of Quality Machine Tools Since 1974

DCM
ROTARY GRINDERS

WHERE THE FACE OF PRECISION BEGINS

DCM got the Point years ago when designing the "SD" series rotary grinders. Variable spindle RPM, table speeds, and feedrates can be optimized for Diamond & CBN abrasives. Programable parameters can be saved for repeatable performance in lab or production applications.

With over 30 years of machine design and manufacturing experience, DCM Tech builds a line of industrial grinders for a variety of applications. DCM grinders offer fast, close tolerance performance whether grinding metal, glass, carbide or ceramic. Innovative control packages provide process automation and repeatability. Integral mist collection and coolant filtration systems enhance grinding performance as well as shop cleanliness and operating conditions.

Made in U.S.A.

DCM TECH
4455 Theurer Blvd.
Winona, MN 55987
INTEREST@DCM-TECH.COM
1-800-533-5339
www.dcm-tech.com

APOGEE PRECISION PARTS

ISO 9001:2008 CERTIFIED

QUALITY
SERVICE
DESIGN

The Apogee design team is focused on your individual needs and requirements to insure that every aspect of your custom project will be handled with the highest degree of professionalism.

We offer a unique process that insures the highest quality product at the most competitive price and our staff understands the importance of a working relationship with our customers to guarantee their complete satisfaction.

You will be extremely pleased with our knowledge and unmatched quality due to decades of experience in drawing refractory metals including Tantalum, Niobium, Zirconium and Titanium cans and cups.

Call or email us today to discuss your individual requirements and allow us to provide you with a custom competitive quote.

55 Access Road • Suite 600 • Warwick, Rhode Island 02886 U.S.A.
(401) 732.3634 • Fax (401) 732.5237 • E-mail: info@apogeeparts.com • www.apogeeparts.com

ABN900 For precision grinding automotive and aerospace components

ABN900 is a high-performance grinding material for electroplated applications. It removes material faster with lower grinding forces than previously available grits because it has exceptional high strength, uniformity and a consistent blocky shape. This delivers durability that helps tools to work harder and extends tool life by as much as 55%*. ABN900 is designed for precision grinding hardened ferrous metals and superalloys especially in the automotive and aerospace industries.

Find out more by visiting our website or contact Element Six directly.

* Grinding tests conducted by Element Six with ABN900 50/60 US Mesh show the potential for extending tool life by up to 35%. Tests using ABN900 120/140 US Mesh show the potential for extending tool life by up to 55%. Contact Element Six for details of these tests, product samples and results.

elementsix™

Element Six US Corporation,
35 West 45th St., New York, NY 10036, USA
Tel: +1 (212) 869 5155
Fax: +1 (212) 764 0349
Email: usadvancedmaterials@e6.com
www.e6.com/ABN900